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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/083,076	02/26/2002	David Chaohua Wu	13586US01	4707
23446	7590	06/06/2005	EXAMINER	
MCANDREWS HELD & MALLOY, LTD 500 WEST MADISON STREET SUITE 3400 CHICAGO, IL 60661			CHOW, CHARLES CHIANG	
			ART UNIT	PAPER NUMBER
			2685	

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/083,076

**Applicant(s)**

WU ET AL.

**Examiner**

Charles Chow

**Art Unit**

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/6/2005.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**Detailed Action*****Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-2, 8, 12, 15, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagai (US 4,486,897) in view of Wang (US 6,356,598 B1).

Regarding **claim 1**, Nagai teaches a system for demodulation of secondary audio program information (a system for demodulating sound signal  $S_{I2}$  centered at  $5f_H$ , 5 times horizontal deflection frequency of the composite signal Scmps, Fig. 1-3, abstract), the system comprising a bandpass filter (BPF 6) for isolating the secondary audio program information from a composite audio signal (the BPF 6 to separate third sound signal  $S_{I2}$  in Scmps, multiplexed sound broadcast signal, on terminal 1, col. 3, line 38 to col. 4, line 11), an FM demodulator (FM demodulator 12 for demodulating  $S_{I2}$ , secondary audio program SAP, utilizing isolating BPF 6, for selecting  $S_{I2}$  signal located at 5 times of the horizontal deflection frequency  $5f_H$ , Fig. 3, col. 4, lines 12-65). Nagai fails to teach the Hilbert filter for producing a copy of secondary audio program information with phase shift, for demodulating SAP using copy of SAP with phase shift and delayed copy of SAP to produce an FM demodulated signal. However, Wang teaches these features, the digital demodulator 22 (Fig. 3) for delaying the in-phase digitized signal from ADC 19 in delay module 322, the Hilbert filter 320 for shifting the digitized signal to a quadrature phase shifted signal, 90 degree, for demodulating by complex multiplier 324 ) in a HDTV receiver (Fig. 3, abstract, col. 3, line 45 to col. 4, line 24). Wang teaches an improved method for removing amplitude,

phase distortion for a demodulator in HDTV receiver by utilizing a phase control loop for the NCO 348. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai with Wand's quadrature phase shifting Hilbert filter 320, in phase signal delaying by delay 322 for demodulating broadcast signal, such that amplitude and phase distortion could be reduced.

Regarding **claim 2**, Wang teaches a delay module (322, Fig. 3) for delaying broadcast VSB audio of the HDTV program to produce the delayed copy of the sampled signal from delay 322 (col. 3, lines 66-67). Nagai teaches the SAP audio program demodulation for the language audio at  $5f_H$ .

Regarding **claim 8**, Wang teaches the Hilbert filter producing a copy of the audio program information with a 90 degree phase shift, the quadrature phase shifting of the sampled, copied, signal from Hilbert filter 320 (col. 3, lines 60-66). VSB audio of the HDTV Nagai teaches the SAP audio program demodulation for the language audio at  $5f_H$ .

Regarding **claim 12**, Nagai teaches a method for demodulation of a signal comprising isolating desired signal information from an audio signal (the audio  $S_{12}$  signal in composite signal Scmps, by utilizing bandpass filter, BPF 6, col. 3, line 38 to col. 4, line 11), an FM demodulator (FM demodulator 12 for demodulating  $S_{12}$ , secondary audio program SAP, utilizing isolating BPF 6, for selecting  $S_{12}$  signal located at 5 times of the horizontal deflection frequency  $5f_H$ , Fig. 3, col. 4, lines 12-65). Nagai fails to teach the phase shifting copy of the desired signal information to produce a phase shifted copy of the desired information, and using non-unit delay a copy of the desired signal information to produce a delayed copy of desired signal information. However, Wang teaches these features, the digital demodulator 22 (Fig. 3) for delaying the in-phase digitized signal from ADC 19 in delay module 322, the Hilbert filter 320 for shifting the digitized signal to a quadrature phase

shifted signal, 90 degree, for demodulating by complex multiplier 324) in a HDTV receiver (Fig. 3, abstract, col. 3, line 45 to col. 4, line 24). Wang teaches the non-unit delay, the delay 322 generate a delay of the processed signal so that to match the delay of Hilbert filter 320, for the delay which is not a unity delay (col. 3, line 60 to col. 4, line 8). Wang teaches an improved method for removing amplitude, phase distortion for a demodulator in HDTV receiver by utilizing a phase control loop for the NCO 348. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai with Wang's quadrature phase shifting Hilbert filter 320, in phase signal delaying by delay 322 for demodulating broadcast signal, such that amplitude and phase distortion could be reduced. Regarding **claim 15**, Wang teaches the Hilbert filter producing a copy of the audio program information with a 90 degree phase shift, the quadrature phase shifting of the sampled, copied, signal from Hilbert filter 320 (col. 3, lines 60-66). VSB audio of the HDTV Nagai teaches the SAP audio program demodulation for the language audio at  $5f_H$ . Regarding **claim 19**, Nagai teaches a method for audio program signal demodulation using a bandpass filter, BPF 6 with a simple, minimal number of, coefficient to isolate the audio signal to isolate  $S_{12}$  in composite signal  $S_{cm}$ , for demodulating sound signal  $S_{12}$  centered at  $5f_H$ , 5 times horizontal deflection frequency of the composite signal  $S_{cm}$ , by utilizing FM demodulator, Fig. 1-3, abstract), Nagai fails to teach the using a Hilbert filter with minimal number of coefficients to produce a signal in phase quadrature, the using a simple approximation for FM demodulation and signal in quadrature phase. However, Wang teaches these features, the digital demodulator 22 (Fig. 3) having simple approximation for demodulation by utilizing multiplier 324 to multiplying delayed digital signal and quadrature phase shifted signal with the Sin, Cos signal from NCO 348 (col. 4, lines 37-50), the ADC 19 coupled to a delay module 322, a Hilbert filter 320 for providing phase shift of the digitized

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signal to a quadrature, 90 degree, phase shifted signal with minimum number of coefficient as needed to shift the phase to quadrature, 90 degree, phase position, for demodulating by complex multiplier 324 in a HDTV receiver (Fig. 3, abstract, col. 3, line 45 to col. 4, line 24). Wang teaches an improved method for removing amplitude, phase distortion for a demodulator in HDTV receiver by utilizing a phase control loop for the NCO 348. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai with Wang's quadrature phase shifting Hilbert filter 320, in phase signal delaying by delay 322 for demodulating broadcast signal, such that amplitude and phase distortion could be reduced.

2. Claims 4, 9-10, 14, 16-17, 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagai in view of Wang, and further in view of Kammeyer (US 4,506,228).

Regarding **claim 4**, Nagai and Wang fail to teach the lowpass filter for eliminating noise from the FM demodulated signal. However, Kammeyer teaches the low pass filter 150 coupled to demodulator (Fig. 14) for reducing or limiting noise with gently rising characteristic that falls off above the limit frequency at the upper frequency limit (col. 13, line 63 to col. 14 line 7), the cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63). Kammeyer teaches an improved digital FM demodulator with frequency accuracy, signal quality and low cost (col. 1, lines 15-57). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai, Wang, with Kammeyer's low pass filter at the output of the demodulator, such that the noise could be reduced by utilizing the output low pass filter, for quality, low cost FM demodulator.

Regarding **claim 9**, Kammeyer teaches FM demodulator uses a simplified approximation for simplified demodulation of the audio signal, the simplified approximation  $\frac{1}{4} * \Delta\Omega T * V(k^T)$  for the FM demodulation, the  $\Delta\Omega$  is  $f_{dev}$  frequency deviation in applicant's specification (col. 6, lines 32-63), the  $\Delta\Omega T$  is equivalent to applicant's  $2\pi f_{dev}$ . Nagai teaches the SAP audio.

Regarding **claim 10**, Kammeyer teaches FM demodulator produces the FM demodulated signal using  $I(n) * Q(n-d) - Q(n) * I(n-d)$  wherein  $I(n)$  represent delayed copy,  $Q(n)$  represent phase shifted copy,  $d$  represent a non-unity delay and  $n$  represent a discrete time index, the digital demodulator (Fig. 1) to demodulate FM signal by cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63; col. 17, line 61 to col. 18, line 40).

Regarding **claim 14**, Kammeyer teaches eliminating noise from the FM demodulated signal, the low pass filter 150 coupled to demodulator (Fig. 4) for reducing or limiting noise with gently rising characteristic that falls off above the limit frequency at the upper frequency limit (col. 13, line 63 to col. 14 line 7),

Regarding **claim 16**, Kammeyer teaches FM demodulator uses a simplified approximation for simplified demodulation of the audio signal, the simplified approximation  $\frac{1}{4} * \Delta\Omega T * V(k^T)$  for the FM demodulation, the  $\Delta\Omega$  is  $f_{dev}$  (col. 6, lines 32-63), the  $\Delta\Omega T$  is equivalent to applicant's  $2\pi f_{dev}$ . Nagai teaches the SAP audio.

Regarding **claim 17**, Kammeyer teaches FM demodulator produces the FM demodulated signal using  $I(n) * Q(n-d) - Q(n) * I(n-d)$  wherein  $I(n)$  represent delayed copy,  $Q(n)$  represent phase shifted copy,  $d$  represent a non-unity delay and  $n$  represent a discrete time index, the digital demodulator (Fig. 1) to demodulate FM signal by cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the

delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63; col. 17, line 61 to col. 18, line 40).

Regarding **claim 21**, Kammeyer teaches the low pass filter with a minimal number of coefficient (the gently rising characteristic that falls off at upper frequency), the low pass filter 150 coupled to demodulator (Fig. 14) for reducing or limiting noise with gently rising characteristic that falls off above the limit frequency at the upper frequency limit (col. 13, line 63 to col. 14 line 7).

Regarding **claim 22**, Kammeyer teaches FM demodulator produces the FM demodulated signal using  $I(n) * Q(n-d) - Q(n) * I(n-d)$  wherein  $I(n)$  represent delayed copy,  $Q(n)$  represent phase shifted copy,  $d$  represent a non-unity delay and  $n$  represent a discrete time index, the digital demodulator (Fig. 1) to demodulate FM signal by cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63; col. 17, line 61 to col. 18, line 40).

3. Claims 3, 5-7, 11, 13, 18, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagai in view of Wang, and further in view of Collier et al. (US 5,404,405).

Regarding **claim 3**, Wang mentioned AGC circuit in col. 2, lines 3-4, col. 6, lines 24-26.

Nagai and Wang fail to teach an automatic gain control for normalizing amplitude of an FM carrier signal at the FM demodulator. However, Collier et al. (Collier) teaches these features, the divider 30 for normalizing the amplitude of the audio sub-carrier,  $I^2 - Q^2$  by  $I^2 + Q^2$ , the dividing of the sub-carrier power by the pilot signal power (col. 4, lines 27-38). Collier teaches the FM demodulator having delayed copy and phase shifted copy from Hilbert filter 18, for demodulating audio signal on the sub-carrier 38 KHz, using digital signal processing

DSP (abstract, col. 1, line 62 to col. 2, line 45, col. 1, lines 8-10), to reducing the signal distortion (col. 1, lines 42-66). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai, Wang, with Collier's normalized sub-carrier extraction for FM demodulation, such that the signal distortion could be improved.

Regarding **claim 5**, Collier teaches the bandpass filter comprises a finite impulse response filter FIR, the digital filter 8 is a FIR filter (Fig. 1, col. 2, lines 58-67) for processing FM signal.

Regarding **claim 6**, Collier teaches the bandpass filter comprises a 32-tap FIR filter, the bandpass filter 8 is cascaded with M section taps (col. 2, lines 63-64), the number of individual FIR filter, taps, is a matter of design choice for enabling the signal demodulation (col. 3, line 37-45).

Regarding **claim 7**, Collier teaches the Hilbert filter comprises an 11 tap Hilbert filter, the Hilbert filter 18 having sample length N, taps, and N can be selected for tradeoff between performance and cost. N can be on the order of 15.

Regarding **claim 11**, Collier teaches the delay, d, is 2, the delay 20 is set according to  $(N-1)/2$ , and N has to be of minimum value for  $(N-1)/2$ . If N is equal to 1, then,  $(N-1)/2$  is zero (col. 4, lines 1-13).

Regarding **claim 13**, Collier teaches the normalizing amplitude of an FM carrier at the FM demodulator, the divider 30 for normalizing the amplitude of the audio sub-carrier,  $I_2-Q_2$  by  $I_2+Q_2$ , the dividing of the sub-carrier power by the pilot signal power (col. 4, lines 27-38).

Regarding **claim 18**, Collier teaches the delay, d, is 2, the delay 20 is set according to  $(N-1)/2$ , and N has to be of minimum value for  $(N-1)/2$ . If N is equal to 1, then,  $(N-1)/2$  is zero (col. 4, lines 1-13).

Regarding **claim 20**, Wang mentioned AGC circuit in col. 2, lines 3-4, col. 6, lines 24-26.

Nagai and Wang fail to teach an automatic gain control for normalizing amplitude of an FM

carrier signal at the FM demodulator. However, Collier et al. (Collier) teaches these features, the divider 30 for normalizing the amplitude of the audio sub-carrier,  $I2-Q2$  by  $I2+Q2$ , the dividing of the sub-carrier power by the pilot signal power (col. 4, lines 27-38).

4. Applicant's arguments filed 2/2/2002 have been fully considered but they are not persuasive.

Regarding applicant amendment in claim 12, based on the no teaches of the non-unity delay, Wang teaches the non-unit delay, the delay 322 generates a delayed signal at its output in order to match the delay occurred in Hilbert filter 320, for the delay which is not a unity delay, for matching the delay occurred in Hilbert filter 320 (col. 3, line 60 to col. 4, line 8).

Regarding applicant's argument for no teachings from Nagai for the delayed signal and a Hilbert filter signal for FM demodulation (page 8 of applicant's amendment), Nagai does teach the FM demodulator 12 but no further description about the details of the FM demodulator. However, Wang teaches, for example, a demodulator 22 using delay 322 and Hilbert filter 320 for demodulating received signal via complex multiplier 324 (Fig. 3), for the FM demodulation in Nagai.

Regarding applicant's argument for the no teachings from Wang for the demodulation of secondary audio program and the bandpass filter (applicant amendment page 9), Nagai teaches the bandpass filter 6 for selecting secondary audio program third sound signal for the audio demodulation in FM demodulation 7 (abstract, Fig. 2-3, col. 3, line 38 to col. 4, line 39). Wang does teach a Hilbert filter 320 which is known in technology that a Hilbert filter can providing a output signal having 90 degree phase shift, from the famous Hilbert transformation. Regarding the no teaches for the Hilbert filter with minimal number of

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coefficients along with a simple approximation FM demodulation (applicant amendment, page 9), it has shown in the previous office action in claim 4, 16, 21, that Kammeyer teaches an example filter such as the low pass filter with a minimal number of coefficient, for the gentle frequency response rising characteristic that falls off at upper frequency for reducing, limiting noise with the gentle rising characteristic (col. 13, line 63 to col. 14 line 7).

Kammeyer also teaches FM demodulator uses a simplified approximation for simplified demodulation of the audio signal, by utilizing simplified approximation,  $\frac{1}{4} * \Delta\Omega T * V(k^T)$ , for the FM demodulation (col. 6, lines 32-63). Besides, there are other references also teach **FM demodulation using delayed signal and Hilbert filter transformed signal, from Collier et al. (US 5,404,405), Nakai et al. (US 4,862,099), and Hwang (US 5,440,269).** Other reference from **Lafay et al. (US 6,476,878B1)** also teaches the band pass filter 48 for extracting auxiliary sound signal 21 for further signal processing (abstract, Fig. 2, Fig. 4).

The demodulation using delayed signal and Hilbert filter transformed signal is known in technology, and Nagai already taught the band pass filter 6 for extracting third sound signal for the secondary audio program, to be demodulated at FM demodulation 12.

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

**Conclusion**


6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles C. Chow whose telephone number is (703)-306-5615. The examiner can normally be reached on 8:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (703)-305-4385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Charles Chow C.C.

March 21, 2005.

  
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